

on the following two days was giving southeasterly to northwesterly gales of force 9 near the 40th parallel and between meridians 150° and 160° east. The lowest observed pressure in connection with the disturbance was 29.28 inches recorded on board the British S. S. *Robert Dollar*, in 39° 52' N., 150° 59' E., near midnight of the 24th. This cyclone seems to have moved into the Aleutian area and thence into the Gulf of Alaska, where it remained practically stationary during the last three or four days of June.

The following vessels reported waterspouts:

American S. S. *Ensley City*:

June 6, 2 p. m. Passed a waterspout in latitude 11° 43' N., longitude 90° 30' W., traveling from SW. to NE. Dark rain clouds overhead.

American S. S. *President Jefferson*:

June 30, 8 a. m. (civil date). In latitude 37° 12' N., longitude 144° 30' E., sighted a large waterspout about 400 feet high, lasting about 10 minutes. Wind calm at the time; weather occasionally squally; sea smooth.

SOUTHWEST MONSOON IN ARABIAN SEA; GALES IN SOUTH PACIFIC OCEAN

By ALBERT J. McCURDY, Jr.

Gales in the Arabian Sea during the period June 9-23 as reported by vessels traversing shipping routes in that region point to a strong development of the southwest monsoon.

During this period the American steamships *William Penn*, *Anniston* and *Standard Arrow* encountered moderate to fresh gales.

The *William Penn*, Capt. R. H. Wright, proceeding from Singapore toward Karachi, on the 9th encountered a moderate southwesterly gale accompanied by rough seas. Mr. J. E. King, second officer, reports that the lowest pressure observed was 29.71 inches, at 5.37 p. m., in 5° 43' N., 84° 15' E. The wind at the time was SW., force 6, later increasing to force 7. Similar conditions prevailed throughout the 10th.

On the 10th the *Anniston City*, Capt. H. Doyle, proceeding from Calcutta to Boston, via Colombo, encountered

a southwesterly gale in 6° 31' N., 86° 10' E. Mr. W. J. Mullaney, third officer, states that the lowest barometer, 29.55 inches, was recorded at 11 a. m., on the 10th. The wind at this time was W., force 7, later shifting to SW., and increasing to a fresh gale that lasted until noon of the 12th. Almost identical conditions were experienced on the 22d and 23d in 12° 46' N., 55° 57' E.

From the 11th to 17th the *Standard Arrow*, Capt. J. C. Harding, proceeding from Calcutta to Port Said, steadily experienced southwesterly winds of force 7 to 8, accompanied by rough seas. The observer, Mr. W. Townsend, reports that the barometer was steady during this period, ranging between 29.72 and 29.82 inches.

The first gale in the South Pacific was associated with a disturbance off the coast of Chili that appeared on June 9 and until the 12th occasioned moderate to whole gales with high seas. The Danzig S. S. *Gedania*, Capt. T. Schroeder, bound for San Pedro from Campana (southern Chili), came within its influence on the 9th. Mr. F. Hesse, third officer, reports that the lowest pressure observed was 29.37 inches (uncorrected), occurring at noon on the 9th in 44° 54' S., 80° 46' W. The wind at this time was W. by S., force 10. Rough weather continued through the 11th.

A report of the second gale in the South Pacific was received from the British S. S. *Tahiti*, Capt. R. C. Showman, bound from Sydney to Wellington. The observer, Mr. S. Hodson, states that a fresh gale began at 10 p. m., on the 20th accompanied by frequent heavy rain squalls. The lowest barometer recorded was 30.01 inches, this occurring at 10.42 p. m., in 37° 04' S., 160° 30' E. The wind at the time was SSW., force 8. This gale lasted throughout the morning of the 21st and during that time the wind remained steady, blowing from the SSW.

The same vessel again encountered heavy squalls on the 23d, while in the vicinity of New Zealand, reporting conditions similar to those experienced in the previous storm. The lowest pressure was 29.51 inches, occurring on the 24th, in 41° 20' S., 174° 50' E. At this time the wind was W., force 7. The gale ended on the 25th. Highest force of wind 8, from SW. by W.

551.506 (73) DETAILS OF THE WEATHER IN THE UNITED STATES

GENERAL CONDITIONS

By A. J. HENRY

The cool showery weather of the previous month in northeastern United States continued through the middle of June and even into the third week of the month. On the whole the northeastern districts (east of Rocky Mountains and north of Tennessee) were cool and the remainder of the country was warm. Precipitation was very irregularly distributed, drought in Pacific Coast States and west of the Rockies continuing. The usual details follow.

CYCLONES AND ANTICYCLONES

By W. P. DAY

The low-pressure areas were generally characteristic of the month of June with an increasing frequency of development over the Rocky Mountain and Plateau regions and central interior districts. Three of these LOWS

which developed over the Plateau and Rocky Mountain regions became important storms for a day or two and then rapidly declined in intensity.

Of the 10 high-pressure areas which seemed worthy of charting only two were of much importance in their effects. The first, a HIGH of the Hudson Bay type, gave cool easterly winds to the Northeastern States and the Middle Atlantic States from the 9th until about the 13th; while the second, an Alberta HIGH, pushed down from the northwest and slowly overspread middle and northern sections east of the Rockies with abnormally cool weather over these regions from the 29th of June until about the 6th of July.

FREE-AIR SUMMARY

By V. E. JAKL, Meteorologist

The average free-air conditions over the country as determined by kites at the six aerological stations showed throughout the range of altitude covered by the observations, no important departures from normal.

Certain pronounced departures within limited altitudes, however, observed at some stations, were significant in their relation to the surface-weather conditions that prevailed over the regions affected. The month had some unusual features, to which can be attributed the difficulties encountered at a number of stations in obtaining kite observations with the desired regularity. Frequent precipitation at Royal Center and Drexel, and an unusual number of thunderstorms at the latter station, taxed the ingenuity of the station forces to obtain satisfactory flights under safe conditions. At Drexel, contributing to the rainfall of the wettest month in the history of the station, there were 21 days with measurable amounts of precipitation and 19 days with thunderstorms. At Due West light winds handicapped the work, velocities insufficient for launching kites restricting observations by that method to about half the days of the month. At the other stations more favorable conditions for kite observations prevailed. At Broken Arrow, a flight to 6,700 meters on the 3d exceeded all previous records for altitude at that station. In this flight, made in the front of a weak HIGH, the winds were from a general northwesterly direction throughout the air column sounded, the velocities increasing steadily from light on the ground to gale force at the highest point. Humidity diminished gradually from the ground to very dry air at the top, while temperature fell regularly at about the normal lapse rate.

Referring to Table 1, it will be noted that well-marked temperature departures extending to the upper limit of observation occurred only over eastern North Dakota, where the Ellendale record shows that it was uniformly a little colder than normal at all levels observed and at Royal Center to a less degree than at Ellendale. Over other aerological stations, free-air temperatures were generally slightly above normal. Chart III, this REVIEW, showing the surface-temperature departures, may be considered a fair representation of the free-air departures as well, inasmuch as the departures aloft and at the surface did not differ much at any station.

An inspection of the wind resultants (Table 2) shows normal directions and velocities over all stations except Drexel and Ellendale. The wind resultants at all stations for all altitudes are substantially in agreement with the results of pilot-balloon observations, and can therefore be accepted as a true representation of wind conditions for the month, notwithstanding the many interruptions to regular kite observations experienced at some of the stations. At Drexel the winds averaged about southeast in the lower levels up to about 1,250 meters, as compared with normal directions for those levels ranging from south to southwest, while in the upper levels above 2,000 meters, the resultants had a much stronger northwesterly component than normal. Over Ellendale,

in the lower levels to 1,000 meters the resultant winds were northerly, or about opposite the normal and diametrically opposed to the winds at corresponding levels at Drexel. In the upper levels above 2,000 meters, the winds were more northerly than normal, and about the same direction as at Drexel.

Opposing winds in the lower levels at Drexel and Ellendale undoubtedly had an important bearing on the abnormal weather conditions prevailing at the former station as regards precipitation and thunderstorms. The surface-wind record at Drexel shows that most of the precipitation at that station was associated with comparatively brief intervals of northerly wind breaking in on the prevalent southeasterlies.

The best example of upper air observations made close to the rain area and hence best illustrating the conditions accompanying this type of precipitation during the month, is afforded by the kite and pilot balloon observations at Ellendale for the 14th. The results are given in the following table, and are apparently typical of conditions that accompanied many of the rain storms at both Drexel and Ellendale.

Meteorological conditions at Ellendale, N. Dak., on June 14, 1924

[Altitude, m. s. l., meters]

WIND DIRECTIONS AND VELOCITIES, M. P. S.

Time	Surface	500	750	1,000
2:07-2:24 p.m.	S.-4	S.-4	S.-5	SSE.-4
9:10-10:24 p.m.	NNE.-4	NNE.-5	NNE.-8	NNE.-9

TEMPERATURE, °C

9:10-10:24 p.m.	16.9	17.0	17.6	16.4
-----------------	------	------	------	------

HUMIDITY, PER CENT

9:10-10:24 p.m.	94	92	81	70
-----------------	----	----	----	----

WIND DIRECTIONS AND VELOCITIES, M. P. S.

Time	1,500	2,000	2,500	3,000	3,400
2:07-2:24 p.m.	SSE.-5	S.-5	SSE.-3	W.-5	W.-9
9:10-10:24 p.m.	NNE.-10	NNE.-11	N.-12	NW.-13	WNW.-19

TEMPERATURE, °C.

9:10-10:24 p.m.	13.7	10.9	7.5	4.1	1.7
-----------------	------	------	-----	-----	-----

HUMIDITY, PER CENT

9:10-10:24 p.m.	60	57	57	58	41
-----------------	----	----	----	----	----

Rain began almost immediately after the afternoon pilot-balloon observation, the surface wind simultaneously shifting abruptly from southerly to northerly, accompanied by a sudden drop in temperature. As the balloon observation just preceding the storm shows southerly winds to a considerable height, it is evident that the change to northerly took place first along the ground, gradually extending to the upper levels, until a general condition of northerly winds was attained, as shown by the evening kite observation. Undoubtedly the heaviest precipitation and thunder, recorded in the early part of the storm, were associated with the entering wedge of colder air from the north, while the ending of precipitation indicated that the change in direction had been accomplished from the ground to the prevailing westerlies aloft. The weather maps show indifferent pressure gradients in the vicinity of Ellendale in the morning, changing to gradients north of a well-defined low which had developed from the south.

Relative humidities showed no abnormal features, even at the stations where the month was unusually wet. Over Drexel, in fact, the humidity averaged slightly below normal. This apparent discrepancy can be explained by the fact that the precipitation at Drexel on most days occurred in thundershowers of rather brief duration, and that the kite observations were taken in the intervals of fair weather.

Winds from an easterly direction at high altitudes occurred at a few southern stations during the middle and latter portions of the month, except that at San Juan, P. R., they were of general occurrence at all altitudes throughout the month. In the States, except at Groesbeck and Key West, only single occurrences on scattered dates, are recorded, these being for Broken Arrow, Due West, Memphis and San Francisco. At Groesbeck and Key West, however, they were observed on most days that high observations were possible, from the 10th to the end of the month. When they were not possible, upper clouds were observed moving from an easterly direction. During this period Groesbeck was generally situated southeast of a more or less well-defined trough of low pressure, the easterly winds occurring above winds in the lower levels which conformed roughly to the surface pressure distribution; Key West as a rule was situated within or in the outer fringe of a high lying to the north, northeast or east of the station, and the winds there were generally from an easterly direction at all levels.

It has been found from a statistical study of previous years at Groesbeck that in the summer months there is a strong easterly component in the high-altitude winds above that station. Hence, in connection with the month's record at Key West and San Juan, it may be inferred that a tendency to easterly winds aloft is characteristic of the mid-summer months over the Gulf States. The current month's record at Groesbeck further shows that when this influence is dominating, local disturbances, such as depressions, are effective in overcoming this influence in the lower altitudes only.

Confirming in general the accuracy of these observations, a number of double-theodolite pilot-balloon observations to high altitudes were taken at Groesbeck, one on the 14th extending to the unusually high altitude of nearly 14,000 meters. A double-theodolite observation made at Broken Arrow on the 21st, extended to 13,500 meters, and showed mostly easterly winds to 7,000 meters, and westerly winds above. The computation of all the double-theodolite observations showed an ascensional rate in excellent agreement with the adopted standard, on which single-theodolite work is based.

TABLE 1.—Free-air temperatures, relative humidities, and vapor pressures during June, 1924

Altitude m. s. l. (m.)	Broken Arrow, Okla. (233 m.)		Drexel, Nebr. (396 m.)		Due West, S. C. (217 m.)		Ellendale, N. Dak. (444 m.)		Groesbeck, Tex. (141 m.)		Royal Center, Ind. (225 m.)	
	TEMPERATURE (°C.)											
	Mean	De- parture from 6-yr. mean	Mean	De- parture from 6-yr. mean	Mean	De- parture from 4-yr. mean	Mean	De- parture from 7-yr. mean	Mean	De- parture from 6-yr. mean	Mean	De- parture from 6-yr. mean
Surface..	26.1	+1.2	19.7	-1.7	26.4	-0.1	17.5	-2.0	25.8	0.0	21.5	-1.7
250.....	26.0	+1.2	19.7	-1.7	26.1	0.0	17.5	-2.0	24.7	-0.1	21.1	-1.8
500.....	24.0	+1.2	19.2	-1.5	23.9	+0.5	17.2	-2.0	22.7	-0.1	18.6	-1.6
750.....	22.4	+1.2	18.0	-1.2	22.3	+0.7	16.5	-2.1	21.5	+0.2	16.6	-1.6
1,000.....	21.6	+1.7	17.4	-0.6	20.9	+0.9	13.7	-2.5	21.0	+0.9	15.2	-1.4
1,250.....	20.9	+2.3	16.7	0.0	19.2	+0.8	11.9	-3.1	20.4	+1.5	13.7	-1.4
1,500.....	19.9	+2.7	15.7	+0.2	17.4	+0.8	10.2	-3.5	19.7	+2.0	12.4	-1.8
2,000.....	17.7	+3.4	13.3	+0.6	13.8	+0.5	7.2	-3.6	17.7	+2.4	10.4	-0.7
2,500.....	14.7	+3.2	11.2	+1.5	10.2	+0.2	4.5	-3.5	15.3	+2.6	7.7	-0.6
3,000.....	11.2	+2.8	8.8	+2.1	7.5	+0.4	1.6	-3.6	12.5	+2.4	.....	.....
3,500.....	7.8	+2.6	7.0	+3.5	4.5	+0.5	-1.3	-3.6	9.6	+2.2	.....	.....
4,000.....	4.7	+2.5	4.3	+4.0	1.7	+0.5	-3.3	-2.8	6.2	+1.5	.....	.....
4,500.....	1.7	+2.5	1.6	+4.2	-1.0	+0.1	-7.1	-3.4	1.9	+0.2	.....	.....
5,000.....	-0.9	+2.5	-1.0	+4.8	.....	.....	.....	.....	-2.4	+0.2	.....	.....
RELATIVE HUMIDITY (%)												
Surface..	70	-4	76	+6	66	+3	65	-6	77	+2	74	+10
250.....	70	-4	76	+6	66	+3	65	-6	77	+2	74	+10
500.....	71	-3	73	+5	66	+1	64	-6	80	+3	73	+8
750.....	70	-4	68	+3	65	-1	62	-6	77	+1	75	+12
1,000.....	66	-7	62	-2	63	-1	64	-3	67	-5	74	+11
1,250.....	60	-11	57	-6	67	+1	66	0	59	-9	77	+13
1,500.....	55	-14	54	-7	69	+2	68	+4	52	-12	76	+13
2,000.....	48	-17	54	-4	72	+3	66	+4	42	-15	70	+12
2,500.....	45	-13	51	-5	70	0	61	+2	39	-14	59	+11
3,000.....	43	-11	53	-2	61	-4	58	+4	39	-10	.....	.....
3,500.....	43	-10	42	-12	57	-5	49	-1	39	-8	.....	.....
4,000.....	40	-10	35	-18	54	+1	33	-13	42	-4	.....	.....
4,500.....	35	-11	34	-16	52	+7	34	-14	45	-5	.....	.....
5,000.....	31	-11	34	-18	.....	.....	.....	.....	47	-5	.....	.....
VAPOR PRESSURE (mb.)												
Surface..	23.70	+0.56	17.82	-0.11	22.52	+1.14	13.08	-3.25	25.46	+0.89	19.50	+1.03
250.....	23.53	+0.60	17.82	-0.11	22.20	+1.15	12.71	-3.12	24.37	+0.75	19.02	+0.82
500.....	21.34	+0.87	16.61	-0.20	19.67	+0.91	11.10	-2.78	22.00	+0.48	16.07	+0.19
750.....	19.28	+0.86	14.20	-0.46	17.69	+0.66	10.16	-2.34	19.49	+0.09	14.52	+0.04
1,000.....	17.05	+0.42	12.60	-0.73	16.18	+0.58	8.61	-1.40	16.16	-0.81	13.20	-0.09
1,250.....	14.55	-0.20	11.13	-0.94	14.96	+0.69	9.39	-1.87	13.61	-1.29	12.37	+0.18
1,500.....	12.52	-0.53	9.91	-0.82	13.78	+0.82	8.61	-1.40	11.39	-1.52	11.25	+0.34
2,000.....	9.37	-0.70	8.59	-0.01	11.29	+0.65	6.68	-1.36	8.17	-1.72	8.71	+0.47
2,500.....	7.24	-0.14	7.17	+0.32	8.58	+0.55	5.16	-1.30	6.51	-1.36	5.32	-0.18
3,000.....	5.59	+0.11	6.60	+1.00	6.34	-0.21	3.99	-0.88	5.52	-0.77	.....	.....
3,500.....	4.39	+0.06	5.18	+0.69	4.96	-0.05	2.88	-1.01	4.76	-0.41	.....	.....
4,000.....	3.44	+0.06	4.07	+0.45	4.00	+0.52	2.06	-1.11	4.16	-0.14	.....	.....
4,500.....	2.63	+0.02	3.95	+1.15	3.16	+0.74	1.83	-0.83	3.38	-0.39	.....	.....
5,000.....	1.96	+0.02	3.87	+1.49	.....	.....	.....	.....	2.68	-0.39	.....	.....

TABLE 2.—Free-air resultant winds (m. p. s.) during June, 1924

Altitude, m. s. l. (meters)	Broken Arrow, Okla. (233 meters)				Drexel, Nebr. (396 meters)				Dus West, S. C. (217 meters)				Ellendale, N. Dak. (444 meters)				Groesbeck, Tex (141 meters)				Royal Center, Ind. (225 meters)			
	Mean		6-year mean		Mean		9-year mean		Mean		4-year mean		Mean		7-year mean		Mean		6-year mean		Mean		6-year mean	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Surface.....	S. 5°W.	4.7	S. 4°W.	4.0	S. 47°E.	1.5	S. 1°E.	1.6	N. 75°W.	1.6	S. 86°W.	1.0	N. 2°W.	1.1	S. 34°E.	0.2	S. 21°W.	5.0	S. 7°E.	3.2	S. 63°W.	1.1	S. 54°W.	1.2
250.....	S. 5°W.	4.8	S. 4°W.	4.1	S. 47°E.	1.8	S. 1°E.	2.2	N. 78°W.	1.7	S. 84°W.	1.1	N. 2°W.	1.1	S. 34°E.	0.4	S. 20°W.	6.0	S. 6°E.	3.8	S. 60°W.	1.3	S. 53°W.	1.3
500.....	S. 5°W.	6.2	S. 9°W.	5.4	S. 56°E.	1.8	S. 1°E.	2.2	N. 89°W.	2.7	S. 81°W.	1.6	N. 9°E.	0.8	S. 16°E.	0.4	S. 22°W.	7.9	S. 1°W.	5.3	S. 55°W.	1.8	S. 47°W.	2.2
750.....	S. 13°W.	7.1	S. 14°W.	6.1	S. 58°E.	2.5	S. 10°W.	3.2	S. 85°W.	3.4	S. 75°W.	2.4	N. 16°W.	0.4	S. 4°W.	1.1	S. 22°W.	8.6	S. 4°W.	5.7	S. 64°W.	3.6	S. 65°W.	2.9
1,000.....	S. 23°W.	7.2	S. 21°W.	6.3	S. 61°E.	2.5	S. 25°W.	3.6	S. 87°W.	3.3	S. 77°W.	2.3	N. 74°W.	0.8	S. 19°W.	1.5	S. 26°W.	9.1	S. 9°W.	6.2	S. 86°W.	5.3	S. 70°W.	8.6
1,250.....	S. 36°W.	7.5	S. 26°W.	6.3	S. 23°E.	2.0	S. 37°W.	4.0	N. 85°W.	5.1	S. 81°W.	2.9	S. 84°W.	1.0	S. 42°W.	2.0	S. 27°W.	8.4	S. 10°W.	6.4	N. 86°W.	5.7	S. 78°W.	4.0
1,500.....	S. 44°W.	8.1	S. 31°W.	6.4	S. 10°W.	1.9	S. 50°W.	4.4	N. 88°W.	6.3	S. 84°W.	3.8	S. 89°W.	1.6	S. 47°W.	2.5	S. 28°W.	7.7	S. 12°W.	5.9	N. 87°W.	7.6	S. 85°W.	4.5
2,000.....	S. 53°W.	7.6	S. 38°W.	6.6	S. 67°W.	3.4	S. 56°W.	5.7	N. 80°W.	10.7	S. 89°W.	6.0	S. 85°W.	3.2	S. 59°W.	3.5	S. 26°W.	6.8	S. 13°W.	5.4	S. 84°W.	9.5	S. 84°W.	6.7
2,500.....	S. 59°W.	8.9	S. 39°W.	6.7	N. 76°W.	10.5	S. 71°W.	7.2	N. 85°W.	11.7	S. 89°W.	6.3	N. 81°W.	6.2	S. 72°W.	5.3	S. 23°W.	6.2	S. 16°W.	5.4	S. 81°W.	10.9	S. 82°W.	8.5
3,000.....	S. 74°W.	7.7	S. 40°W.	6.4	N. 63°W.	14.6	S. 77°W.	8.6	N. 80°W.	12.0	W.	7.9	N. 86°W.	7.9	S. 80°W.	7.3	S. 29°W.	6.3	S. 18°W.	5.6	S. 63°W.	12.2	S. 85°W.	10.2
3,500.....	S. 82°W.	7.0	S. 45°W.	7.2	N. 64°W.	15.9	S. 79°W.	9.3	N. 72°W.	11.9	S. 82°W.	8.4	S. 79°W.	12.4	S. 80°W.	9.1	S. 34°W.	3.3	S. 11°W.	5.7	-----	-----	-----	-----
4,000.....	N. 77°W.	10.6	S. 54°W.	7.4	N. 77°W.	15.5	N. 85°W.	8.8	N. 68°W.	10.2	S. 82°W.	9.5	S. 76°W.	15.2	W.	11.3	S. 64°W.	5.8	S. 11°W.	6.4	-----	-----	-----	-----
4,500.....	N. 70°W.	13.6	S. 84°W.	8.0	N. 45°W.	16.5	N. 75°W.	8.6	N. 59°W.	14.7	N. 65°W.	13.2	N. 66°W.	16.3	N. 76°W.	12.9	S. 68°W.	9.5	S. 6°E.	8.3	-----	-----	-----	-----
5,000.....	N. 56°W.	12.5	N. 68°W.	12.4	N. 45°W.	16.6	N. 51°W.	18.5	-----	-----	-----	-----	-----	-----	-----	-----	S. 68°W.	9.9	S. 68°W.	9.9	-----	-----	-----	-----

THE WEATHER ELEMENTS

By P. C. DAY, Meteorologist, in Charge of Division

PRESSURE AND WINDS

As was the case during the preceding month, there were frequent cyclonic developments over the interior portions of the country, particularly from the Rocky Mountains to the Ohio Valley, giving much cloudy, rainy weather over the central valleys, although few of these disturbances reached important proportions or maintained their identity for considerable periods of time. Although, as often happens in summer, these cyclonic conditions were not pronounced, they gave rise to frequent local disturbances such as thunderstorms, hail and wind storms and even tornadoes of severe character, and the month as a whole had an unusual number of such storms.

The first cyclone of the month to develop into importance was central on the morning of the 5th over the middle Missouri Valley, extending northward to Manitoba. This moved rapidly northeastward beyond Lake Superior during the following 24 hours, but it was attended by heavy rains in portions of the Mississippi Valley and by severe local storms in Illinois and near-by States.

Immediately following this, cyclonic conditions developed over the Plateau region, and by the morning of the 7th a disturbance of considerable importance was central over the middle Rocky Mountains. As this moved slowly eastward into the central valleys, heavy rains occurred over wide areas, and severe local storms were reported from many sections of the Mississippi Valley and to the eastward. Low pressure, with attendant showers and local heavy storms persisted over much of the Mississippi and Ohio Valleys and to the eastward until about the middle of the month. On the morning of the 17th unsettled weather had again overspread the western mountains and Great Plains, and heavy rains with local severe storms prevailed during the following 24 to 48 hours from the Mississippi Valley northward to the Dakotas and into the adjacent portions of Canada, the storm having been forced far to the northward on account of anticyclonic conditions existing over the upper Lakes.

Unusually heavy and widespread rains occurred during the first half of the last decade over many sections from the Great Plains eastward, although there were no important cyclonic developments until toward the end of the period.

Toward the latter part of the month pressure diminished over the central valleys, and by the morning of the 28th a fairly well-defined low-pressure area was central over the upper Mississippi Valley. During the following 24 hours this depression moved over the Great Lakes region into the St. Lawrence Valley, attended over portions of northern Ohio during the afternoon of the 28th by one of the severest tornadoes of recent years, a full account of which will be found elsewhere in this issue.

Anticyclones were mainly weak and confined principally to the more northern localities. Those materially affecting the weather occurred during the early part of the second decade, when a high of the Hudson Bay type overspread the more eastern States, giving cool northeasterly winds to those regions; and again near the end of the month an anticyclone moved from western Canada into the Missouri Valley, giving moderately cool weather at the end over most districts.

The distribution of the atmospheric pressure during the month had no pronounced tendency, further than toward lower than normal averages over the central and eastern districts, and to somewhat higher than normal averages over the northwestern and far western districts. Average pressures were higher than during the preceding month from the Mississippi Valley eastward, and mainly lower to the westward.

Despite the fact that barometric changes were mainly slight and the gradients usually shallow, local high winds were frequent and often associated with hail, causing wide damage to crops and injury to trees, buildings, etc. A list of the more important storms of the month follows at the end of this section.

TEMPERATURE

At the beginning of the month temperatures remained below normal from the Great Plains eastward, as had been the case during the preceding month, while west of the Rocky Mountains warm weather continued, though there was some relief from the severe heat experienced during much of the preceding month.

The seven-day period, the 3d to 10th, continued cold over most central and all northern districts, the temperature averages for the week ranging mainly from 6° to 12° below the normal. In the more southern States, however, a change to conditions more nearly normal with regard to temperature had set in and the week as a whole was moderately warmer than normal.

The week following the 10th brought a marked rise in temperature over most northwestern districts during the